THE CHILD MIND

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The world always has found the mind of the child interesting. Heretofore that interest has been an idle interest aroused by seemingly incongruous manifestations within the child-mind; but latterly the interest has taken on a serious intent. The merely glancing curiosity has become a focussed curiosity. The incongruous has appeared so regularly and so constantly that there has seemed to be some order in its manifestations, and the world at last has been forced to change its attitude. The attitude now is scientific. The world now seeks for the reason behind the manifestations, and in that search is exploring the whole aspect of the human mind. But the quest has had its difficulties. This territory, a veritable *terra incognita,* has been difficult of approach. In such territory direction must be sought and paths cut; and it has followed, naturally, that the investigator has made many starts in false directions.

But now, while the quest *is* difficult, is it as difficult as it has been made? Is mind the unknowable thing it has seemed to be? It is if we accept mind as an entity by itself, as a superphysical manifestation; for then the method of its manifestation is difficult to understand. It is not, if we accept mind as a natural phenomenon, as a phenomenon having a physical basis; for then all that we have to do to make it clear is to discover its physical origin.

And here we do not have far to seek, not farther than the brain; for is not the brain the physical basis of mind? Is not the evidence all in favor of this hypothesis? The gradual development of mind keeping pace with the gradual development of the brain; the absence of mind where there is absence of brain; the imperfect mind where there is imperfect brain; the suppression of mind where there is pressure upon the cerebral cortex, and its return when the pressure is removed. We find in fact that, as is the cerebral cortex of man, so is his mind. Every cell in that cortex reflects mind, every swelling convolution is an index of its increasing power.

Mind, therefore, is a physical manifestation; and, as an individual expression, reflects the peculiarities of the individual through whom it is manifested. The manifestation

proceeds through the brain, but may be modified by the behavior of any of the other organs of the body. That is, the physical constitution determines the psychical constitution; the make-up of the individual determines his trend. That the mind is nothing beyond a physical expression must be so, for no living structure can express itself except in terms of its own cells: every tissue is limited by its own constitution. Among the living things upon this earth each separate group has its own radius of action; and in each group the individuals of that group have their own idiosyncrasies arising from individual peculiarities of structure. In man there is a greater individuality; there is a wider latitude in brain development; and it is this wider latitude that has brought about the development of the human mind. This greater radius of action has proceeded through the greater flexibility of the human brain. This brain has come into its own through the development of self-consciousness, through the faculty of conscious direction. *Brain has developed mind, and now mind is developing brain.*

A contradiction now becomes apparent. If the make-up of the individual determines the trend of his mind, how is it possible for that mind to choose its own direction? There may be discovered in this situation a suggestion of the highest importance leading to the proper understanding of the human mind; it contains a revelation of the process through which mind is developed. There is here a conflict; a conflict between the Past and the Present for the determination of the Future; the Past represented by the structure of the brain, the Present by environment as it acts upon that structure, and the Future by the result, that is, the individual. The conflict here is the old, never-ending conflict between heredity and environment as to which shall control the individual. And this is a real conflict. The Past, with its ancestral line extending back to the very beginning of human life, objects to resigning a control so long established; while the Present, *conscious of its own purpose,* demands that it be given a voice in the direction of affairs. The outcome of this conflict will be as the outcome of any conflict: the stronger will win. Following this rule the outcome will not be always to the advantage of the individual; he will not always have the choice as to his own direction. But there is a way to obviate this result. The individual may, if he wishes, make his own choice. But this will depend upon the state of development in which his mind rests, upon his degree of self-consciousness, *whether he knows what he is doing.* If he does know, if his state of conscious-

ness is such that his mind can rise above impulse, his future is safe in his own hands.

Finding, then, that mind is an expression of the brain, we find also that, following the law of development of animal organs, the expression varies with the age. In accordance with that law the child-mind is a primitive mind; it is the primitive expression of a primitive organ. In this organ the conflict between the past and the present is, though very acute, very one-sided. The past is the dominant influence, but the present is making strenuous efforts to secure a foothold. Heredity and environment are striving for the mastery, but heredity holds the advantage in that it is the older.

Our understanding of the child-mind, then, depends upon our understanding of the child-brain, how it is developed and what it means. The child-brain represents the primitive human brain, the brain of a million years ago. In this brain the conflict between the past and the present has only just begun. It is emerging from the purely animal stage, but it is carrying with it the attributes of that stage; the brute is becoming the man, but the brute brain, following the habit of another million years, still asserts itself. It is this double expression of function in the human brain that confuses us. The Past and the Present are two separate entities; but, using the same apparatus, they appear as one. Our confusion has arisen through our looking upon these two as being, both of them, manifestations of mind. And there has been the great error. Only one is a manifestation of mind, the other being merely reflex action. Mind is consciousness, is the knowledge how to direct the brain reaction; the reflex is pure automatism, the response to external stimuli without conscious direction. But the mind, while itself a directing power, may be directed by the reflex, even though the reflex lies outside of consciousness. This is, in truth, the dominant reaction within the child-mind. Let us see how this comes about.

Every individual living at this moment is the present manifestation of an ancestral line extending back into the very mists of the beginning. Every human being represents a line of *human* life at least one million years long, and of life behind the human of no one knows how many millions. It may be perceived from this how complicated a structure the human organism is. It is a structure built up by slow, toilsome effort through countless epochs, each epoch having left its mark thereon. That this is so is becoming more and more evident; the slowly accumulating evidence of man's past points always in the one direction. Is it not true that the living

things upon this earth to-day are but the descendants of other remote forms? Nature proceeds from one form to another; there is no spontaneous generation of higher forms. Man being a part of Nature can be no exception to its rules. He must have come from a lower form, and that lower form must have been an animal very closely related to him in structure. Of a truth the early man was little better than an animal. It must follow, then, that the man-brain in the beginning was no greater than its possessor, for the man and the brain are synchronous.

The transition from animal to man covered a period of great length. And this was in accordance with another law of Nature: the longer the period of development, the better the individual. In the beginning Nature made it easy for the developing man, for it was her purpose to nurse him into a strength that should endure through the long ages that were to be his upon this earth. The primitive environment was a supremely comfortable one; it was, in reality, a lazy one, for it was non-stimulating. The climate always was mild, food always was within easy reach; the primitive mind had little to disturb it. Life was at ease. The primitive mind did not even have to think for itself, its environment not being thought-inducive; and, not being obliged to think, the primitive mind remained as it had begun, a merely automatic function. It responded to external stimuli through the reflex; what little thought it had was reflex thought; mind was not yet strong enough to control the reaction.

The animal, whether brute-animal or man-animal, is a creature of reflexes: he is governed by reflex action. In the man-animal these reflexes manifest themselves in three directions. There is the basic reflex or cell irritability, there is the motor reflex, and there is the thought reflex. If we examine these carefully we shall find that they have developed as the human organism has developed; we find, in fact, that the organism has developed through these. If we go back a hundred million years to the solitary cell, to the time when it is estimated that life began upon this planet, we catch our first glimpse of the reflex. There we find cell irritability answering every purpose of the cell. The reaction there is relatively simple, being the reaction to a primitive environment. But now, advancing our investigation a few millions of years, we come to a period where the single cells have associated together to form organs, and the organs to form organisms. In these positions independent cell-action would mean inharmonious action; for not only are the cells grouped together,

but they also have become differentiated. Cells thrown together into a group cannot act as independent cells, they must act together; and the different groups also must act together, else the organism will disrupt itself through the clashing of independent movements. And so we find here the demand for something that will harmonise the activities of the various independences. The primitive nervous system answered that demand, a system made up of a few nerve fibres conducting impulses to a central station, a station that was nothing more than a receiving station. Again jumping our investigation ahead, we find ourselves at a period when the organism, having reached to a very high degree of development, needs self-direction in order to utilize its higher power. It is at this period that we find the human brain coming into existence.

All of these reflexes interest us, each one according to its position. We are interested in the first, in cell irritability, because it is the starting point of all the reflexes. In the primitive cell the reflex was the expression of the reaction between the cell protoplasm and its environment. The purpose of this reaction was to maintain the well-being of the cell. It was, primarily, a reaction to food, but out of it have been developed consciousness and sex. In its search for food the cell came into contact with three varieties of substance: substances that maintained the integrity of its protoplasm, food; substances that were harmful to its protoplasm, foreign bodies; and the substance of other cells that revivified the cellular protoplasm and furthered the increase in the number of cells through segmentation. Out of contact with foreign bodies was developed tactile sensation, and, out of tactile sensation has come consciousness; out of intercellular contact has come sex. Consciousness, being a supremely higher expression of function and far more subtle, has required the full term of life upon this planet for its development; while sex, being an earlier requirement of animate organisms, was developed very early in the evolutionary process. It might be said, too, that out of this reaction to environment comes pathology. Overstimulation of the cell protoplasm produces excitement, and overexcitement in its turn produces fatigue, and there will follow either an impairment of function or its entire suppression.

Coming now to the motor reflex, we reach the reflex that is of the first importance in our present discussion, for it is through this that the mind had, *and has,* its real beginning. It was the first in actual brain development; it was the first visible reaction of the primitive nervous system; and it has

been the dominating influence in the development of that system. Development of the higher centres adjacent to the motor has followed through the motor. The primitive central nervous system was, as we have seen, nothing more than an automatic station where the incoming stimuli were received, synchronized, and returned as motor impulses. But these reactions were inflexible; they always were the same. A given reflex always performed in the same direction. Being automatic it could not vary; its mechanism was set in the one certain direction. And, later, when the real brain came into action, this method persisted; for this brain having developed through the primitive system could act only after the manner of that system. Even though the animal possessed a brain his actions were not man-actions, for he did not yet possess man-consciousness; his brain was not yet fully organized. It was not yet able to direct itself. At the same time its reach was beyond that of the primitive station. It was the function of the primitive station to preside over the non-conscious activities of the organism, while the brain, ultimately, was to preside over the conscious; the one synchronized the organic activities, while the other was to direct the organism as a whole. The one must, of necessity, be automatic; and the other, while destined to proceed beyond mere automatism, had to begin as had the other. And so, when we come to the primitive man-animal, we find his actions the actions of the primitive brute-animal. They did not proceed through the thought reflexes of the man, they came through the motor reflexes of the animal. His radius of action, therefore, was limited; being reflex it was inflexible.

A third and last jump along the evolutionary path advances us to the period of thought-development. The primary influence in the production of thought was environment. Brain already had been developed, but it was brain that was not conscious of itself. But now great variations took place in environment. Extreme mildness of atmosphere gave place to extreme cold, and cold again to mildness; fearful convulsions of Nature altered the face of the earth; food became more and more scarce, and other living things needing food more and more numerous. The most important event in the history of primitive man took place during this period: the differentiation of his hands. While yet an animal he had learned to use his fore-feet as hands; but this use was automatic in that he used both hands as one. But now a varying environment brought varying uses for his hands. The work of the two hands was becoming finer, that of the right pre-

ceding and going beyond that of the left. It was the diverse influences of a varying environment that developed conscious man out of a merely automatic animal; but it was the increasing importance of his upper extremities that furthered the development of man's consciousness.

The new man was making new movements with his hands, movements that were, literally, out of reach of the brute; and he was associating those new movements with his higher reflexes. *His consciousness was taking hold of them.* The new movements meant different and finer adjustments of his muscles, meant independent action of the various groups, and a finer co-ordination between the groups themselves. They meant, also, co-ordination between the reflexes of those muscles and the higher reflexes; they meant that thought was becoming associated with action. And this increase in the reflex radius made further and further demands upon the brain. Following these demands the brain was forced to adapt itself to the new stimuli coming in to it.

It is to be regretted that we have no fossil remains of the brains of our remote ancestors, that we might compare the structure of the perhistoric brain with that of the brain of to-day. A number of skeletal remains have been uncovered in the deep layers of the earth's crust, but the soft parts, because of their very nature, were not able to endure with them. But advancing knowledge, knowledge built upon research and reason, is bringing to us a revelation of what the primitive brain actually was. In the light of this knowledge we are catching glimpses of the brain of primitive man and of that of his immediate ancestor, pre-man. This knowledge comes to us from two directions: from the examination of skulls found among the skeletal remains of primitive individuals; and from the examination of living brains that seem to approximate, in size and structure, those of the primitive animal.

Inspection of a primitive skull reveals the following facts in regard to the individual to whom it belonged. First, the layer of the earth's crust in which it is found will determine the epoch of the earth's history to which the individual belonged when living. Secondly, the external configuration of the skull will determine whether the individual was brute or man. The determining factors here are: size and shape of the skull as a whole; size and external configuration of the individual bones, this applying especially to the bones to which the muscles of mastication and to those to which the muscles of the neck are attached. Thirdly, the internal configuration

of the bones of the skull will give an idea of the development of the brain that occupied the skull cavity; and the size of the cavity will give the size of the brain.

The living brains of to-day that will help us to an understanding of the primitive brain are the brains of those primates known to us as the anthropoid apes. In very fact, if the brains of the entire monkey series be examined, a very suggestive progressive relationship in regard to size and function will be uncovered. Let me emphasize this by going over, in a very superficial way, several of the varieties of brains belonging to the monkey family, limiting the examination to the lateral aspect of the cerebral hemispheres.

Beginning with the brain of the *marmoset* we find the outer aspect of the cerebrum completely smooth, there being only the Sylvian fissure in evidence.

In the brain of the *capuchin monkey* the convolutions begin to appear, the smooth surface of the cerebrum being divided into broad convolutions by fissures more or less superficial. Of this surface it is seen that the sensori-motor area, the area embracing the precentral and the postcentral convolutions, occupies about one-third, and the areas of the frontal, the temporal, the occipital, and the parietal lobes each about one-sixth.

The brain of the *bonnet monkey* resembles very closely the brain of the capuchin monkey. There is the same general configuration, with the same relative proportion of cortex in the different areas; but here there is a greater attempt at fissure production, and hence a greater area of cerebral cortex.

In the brain of the *yellow baboon* we have an organ larger than either of the preceding, but one in which the configuration of the cerebrum is much the same. But here the fissures have become decidedly deeper and more numerous, with a consequent greater number and a finer arrangement of the convolutions. In this brain the sensori-motor area occupies about one-fourth of the cerebral surface, and the other areas about the same relative proportion of surface. A point to be noted here is that, while the relative proportion of the frontal lobe is the same, the actual area of that lobe is greater in this brain than it is in the brain of the capuchin monkey.

Coming now to the smallest of the anthropoids, the *gibbon,* we enter a region in which the brain topography suggests something more than mere brain. The sensori-motor region is still prominent; but those areas closely adjacent to it, the frontal and the parietal, the so-called areas of the higher centres in man, have altered. In the frontal and the temporal

the fissures have become deeper and, for the first time, three distinct convolutions have appeared; in the parietal the convolutions have become more complicated.

The brain of the *orang,* one of the larger anthropoids, presents a still more complicated surface, especially in the frontal region. The convolutions of the entire surface of the cerebrum are larger and extend more deeply than the convolutions of the cerebra of the previous brains.

The last anthropoid brain which we shall discuss here, that of the *chimpanzee,* is the most interesting. In this brain there is a very close approach to the human type. Its fissures are deep and of good length, especially the Sylvian and the central; its convolutions are well modeled and of a more complicated pattern. Here for the first time we find the frontal region exceeding the sensori-motor in surface. The third frontal convolution has become tortuous and bent upon itself, being suggestively like the same convolution in the human brain. The parietal lobe has widened, and the temporal has increased its convolutions.

Comparing, now, the human brain of to-day with the preceding series we note the ascending similarity; and the thought comes to us that in evolutionary history these brains must all be chapters in the same story. We note the general increase in cortex over the entire cerebrum, but more specially in certain regions. The frontal, parietal and temporal lobes have now become well-defined portions of the brain. The difference here is the difference that accords with the new function taken on by the human brain, that of mind.

I am making no definite assertions as to the position of the immediate ancestors of man; I am saying, merely, that study of the brains of the monkey family will suggest much in regard to the developmental plan of the human brain. Interest in this study will direct our attention in three directions: first, to the external configuration of the brain; secondly, to the microscopic structure of its convolutions; and thirdly, to the configuration of the inner table of the skull against which the convolutions lie.

Following the suggestions it will not be difficult to trace the growth of the man-brain out of that of pre-man.

The pre-brain was a negative brain. It was not self-assertive, self-directing, self-conscious; it was entirely vegetative, merely a reflex station. It was not active, it was reactive; it was not conscious, it was non-conscious. Knowing how this brain performed, we can gather some idea as to its form and structure. This brain, having been a reflex brain, had

as its main centres those that were purely reflex, the motor centres and those having to do with the special senses. Among these the area comprising the so-called sensori-motor region, the precentral and the postcentral convolutions, was the oldest. It may be that the postcentral convolution is older than the precentral. The fact that the sensory fibres are medullated before the motor would indicate that; but this is not a vital point. The two work so in unison that they may be considered to be of the same age. Following these in regular developmental sequence came the centres for smell and taste in the lobus pyriformis, the centre for sight in the occipital lobe, and the centre for hearing in the temporal.

These regions were the oldest regions of the animal brain; their centres were the first active centres, and the limit of action, of the pre-brain. If it were possible to inspect a pre-brain, and its accompanying skull, we should find that the brain was small and symmetrical, with the convolutions carrying the above-mentioned centres the most prominent ones of the entire organ. There would be other cortex, but there would be only enough to allow for the natural expansion that must follow in an organ of this character. We should find some cortex anterior to the precentral convolution, a very rudimentary frontal lobe; we should find some between the postcentral convolution and the centre for sight, a beginning parietal lobe; we should find a very small amount below the first temporal convolution; and there would be a small silent area in the occipital lobe. Inspection of the inner table of the skull enclosing this brain would reveal the impressions made thereon by the convolutions containing the primitive centres, while examination of the centres themselves by means of the microscope would show the characteristic cell and fibre arrangement of to-day in a primitive but well-marked stage of development. In the excess regions the microscope would reveal only a few scattered very rudimentary cells and fibres.

Advancing a further stage in the animal phylogeny, to a period just preceding the emergence of the man-brain, we should probably find a brain of the type of the chimpanzee-brain of to-day. In this brain we find the primitive centres still prominent, still making the deeper markings upon the inner table of the skull; but we find, also, that these markings have altered. The positions of the deeper markings have changed: they are more extensive and are further apart; and other markings are beginning to appear. The areas of the primitive centres have increased somewhat, while the increase in the new areas has been more marked. The region

anterior to the precentral convolution has grown forward into a distinct lobe, with deep fissures and complicated convolutions. The third frontal convolution, *Broca's convolution in the human brain,* has become more complicated than any of the others of this region, while those convolutions closely anterior to the precentral are the next in the order of development. In the parietal and the temporal regions corresponding increases in the convoluted surfaces will be found.

We see in this arrangement of the cortex of the animal-brain what seems to be preparation for the higher function of the man-brain; in thus expanding, the animal-brain is laying the foundations of those centres that, arising through its own primitive centres, are to raise the animal to the man class. Comparison of the microscopic structure of the chimpanzee-brain with that of the man-brain will demonstrate this.[1] The minute structure of the cerebral centres of the chimpanzee will be found almost to duplicate those of man. The difference is the difference that might be expected between an undeveloped and a developed brain.

Another step with our phylogenic seven-league boots and we find ourselves actually within the domain of man. The brain of man, well-advanced along the developmental path, is before us. Looking at it carefully we note the difference between this brain and the brain of pre-man. The pre-brain is small, symmetrical; the man-brain is large, asymmetrical. The difference is eminently one of development; development has increased the scope and the complication of brain-function, and has caused the asymmetry. The newer regions have doubled their capacities in the man-brain; but in the development of the new centres the development has proceeded unevenly, some have developed earlier, and some faster than others; each centre, produced through long ages of effort, has its own position in a regular developmental sequence. It is thus that the human cerebra have developed irregular and unequal contours.

In this brain the promise of the pre-brain is fulfilled: the man-brain has become an assured fact. The centres most concerned in this advancement are those situated within the frontal lobe: the centre for speech, and those centres which are the outcome of the differentiation of the hands. The parietal, too, has become of great importance, but its importance is secondary to that of the frontal. The frontal leads in those functions which are peculiarly man-functions. The new func-

[1] See "The Localization of Cerebral Function," by Alfred W. Campbell, for very exhaustive researches in this direction.

tions are associated functions; that is, they are associated with other functions in their operating mechanism. This association is two-fold: with centres immediately adjacent, and with centres in other regions of the brain. As an illustration of the first we note the centre for speech in the frontal lobe, which seems to be merely an enlargement of the motor area; the centre for word-hearing in the superior temporal convolution, which is actually an extension of the centre for hearing in the same convolution; and the centre for word-seeing in the gyrus angularis, an offshoot from the centre for sight in the adjacent occipital lobe. As an illustration of the second we note the association of the centres in the precentral and in the frontal regions to the visual centre at the posterior extremity of the cerebrum.

But these new centres, while offshoots of old, have not been made in a moment; in the upbuilding of brain-tissue Nature requires time. There is no spontaneous creation of tissue here, it is the tedious process of slow ages. And in this tissue there is a peculiar situation. While it gives no evidence of activity during its upbuilding, still it is not inactive; while it cannot respond to external stimuli, it can receive them. This is in line with the developmental plan. Sensory fibres are medullated before the motor; sensory stimuli are received long before motor responses can be returned. It is the prickings of the ingoing stimuli that develop consciousness in the centre. This is not to say, however, that there is no attempt at expressing itself on the part of the centre during its upbuilding. It is possible for this centre to make the attempt, but the action resulting from such attempts must, of necessity, be imperfect. No centre is capable of normal action until the structural elements of that centre have become fully developed.

This is shown in the development of the speech centre. Pre-man did not have speech, but he did have sound, uncouth, unmodulated noises. In making these noises he used the muscles concerned in the act as he used his other muscles, as group muscles; upon the impulse *all* the muscles acted together. The action was entirely motor, merely reflex action; there was no consciousness behind the act. After a time the animal found that he could control his voice somewhat, that he could change from one tone to another, that he could modify the uncouth noises proceeding from his throat. He still made the uncouth noises under the stress of sudden emotion, but at other times he was able to guide his utterances into a kind of chatter. At first this was just an aim-

less chatter, but eventually he was able to inject a meaning into the sounds issuing from his larynx. He had become conscious of his larynx, and that consciousness gave to him the power to direct its action. But that power was a long time coming to him; from uncouth noise to co-ordinated sound covered a vast period of developmental effort. The mechanism of speech was too complicated to be adjusted by any shorter process.

This is the method through which the speech centre was developed, and it is the method through which all the brain-centres have been developed; it is the method through which the man-brain has been developed out of the animal-brain. It also is the method by which the individual brain of to-day is brought into function; that is, it is the method through which the adult brain is developed out of the child-brain. The child-brain is not born already developed, *it is born to be developed.* Its position is that of the man-brain during the childhood of the race: it is on the threshold of a higher life. But while its position is the same, its condition is different. The brain of the primitive child was an animal-brain, pure and simple. Its active centres were only those in the primitive areas; the other centres were not active for the reason that they were not yet fully developed, they were in the process of being laid down. *These centres were being created.* In the child-brain of to-day the condition differs in this respect: while the child-brain is an animal-brain in one direction, it is a man-brain in another. It is an animal-brain in respect that it is active mainly through the primitive centres; and it is a man-brain in respect that the man-centres already are laid down. It is actually an embryonic man-brain, for the foundations of the man-brain are there; the foundations are not being laid down, they are finished.

While, however, the child-brain is born in this condition, it is not yet a completed brain. As has been said, the child-brain is a brain to be developed. It is ready for action, but as yet it cannot act, that is, as a man-brain. The new centres, having been created, now must be brought into efficient function. And so, while the child-brain is getting its full growth, these centres are busy receiving stimuli and training themselves for action. At the end of eight years, post-natal, the human child-brain should be able to take care of itself.

During the period of life of the human brain beginning at the fourth month of pre-natal life and ending at eight years post-natal, it exhibits all the phases of development that we imagine the racial brain to have experienced. Up to the period

of the fifth fetal month the cerebral surfaces are completely smooth, the Sylvian fissures being the only fissures in evidence. During the fifth month the other fissures begin to appear, the calcarine, hippocampal and collateral on the median surface, and the central, precentral and the superior temporal on the outer aspect, being among the first. At seven months the surface of the cerebrum is well convoluted, while at nine months the outlines of all the convolutions are completed. Up to this point the size and contour of the human brain remain small and regular, resembling very closely the outlines of the anthropoid brain, but differing from it in one important respect: the extent of the frontal region. After birth the human brain continues its growth; this further growth placing it well in advance of the primitive brain it was. In short, the period of intra-uterine life might be likened to the evolutionary period during which the foundations of the man-brain were laid down, and the period after birth to the period during which the man-brain enlarged those foundations.

Following our discussion of the phylogeny of the human brain we now are the better able to understand the meaning and the method of the child-mind. It now becomes certain that the child-mind is but the expression of a developing brain, and that the expression follows the method of the organ from which it emanates. A further fact here, the puzzling factor in the reaction, is that this expression is the expression of a new function in the course of its development out of an older, firmly established function, the development of the man-function out of the animal-function. This new function varies as it grows, and as it grows has to fight its way against the dominance of the old function. The man is in a contest with the animal: the Present is in a contest with the Past. Our position here, then, should be that of supervisor, of director. We shall need to assist the new function to establish itself, we shall need to assist the man in his fight against the animal, we shall need to assist the Present in its contest with the Past. Left to itself the new might, out of sheer inertia, allow the old to overbear it.

If the child-mind is the equal of the child-brain, then the child-mind is a primitive mind, just as the child-brain is a primitive brain, and the method of the child-mind will be the method of the primitive brain. We saw that the centres of this brain came into action one after the other in an orderly sequence; and we saw further that these centres were developed through the reflex, that their reactions were touch-and-go reactions. The action within the child-mind is purely reflex;

it responds to environment automatically. The mind comes into development slowly, in response to environmental stimuli repeated over a long period. *The centres of the brain have to be prepared for function before they properly can functionate.* To be sure, the foundations of the centres are there, but they are mere foundations put there for the support of the superstructure. But we must not lose sight of one very important fact here: the foundation is the foundation of the man-brain. Therefore, while the basic reaction of the child-brain is reflex, following its animal origin, the secondary reaction is that of the man-brain. In the child-brain these two are very closely associated, the first beginning during the intra-uterine period and the second manifesting itself early in the post-uterine.

The growth of all the human brain-centres illustrates this; but, for a specific illustration, let us touch again upon the centre for speech. We have noted the disposition of Broca's convolution in the anthropoid brain and in the man-brain; and we have noted, also, how function seems to follow that disposition. We note the progression from no-speech to full speech; and, following the development of the brain of the human infant, we find this same developmental sequence there. From the moment of his birth the infant begins to make sounds through his larynx; but these first sounds are not speech-sounds. They are mere noises, uncouth, incoordinated cries. They are signals of distress, that is, of pain, of hunger or of shock. They are pure reflex manifestations; and the capacity for these manifestations never is lost. But after a bit we find that the baby has increased his vocabulary, as it were. He begins to laugh and then to coo; and then, as his development continues, as he gets older, his utterances take on a letter or a syllabic form, and later still a word form. Following the coo the effort is over a single syllable, such as "da," for instance. But the baby will not be able to say "da" at first. He will say "d," haltingly, in the beginning; and then, as the sound comes more and more easily, he will repeat the letter over and over in quick succession. That established, it will be an easy step to the full syllable, and he will use the "da" as he did the "d'." Frequent repetition of "da" automatically creates a word, and soon we hear the baby saying "da-da." Then he learns to associate that word with his father, and speech for him has been established. The centre controlling speech has come into consciousness; and from "da-da" to "ma-ma" and other short, intimate words no great effort is required.

Two factors are behind the progress of the infant brain: that it is an embryonic man-brain, and that the baby is in close association with his environment, represented here mainly by his mother. It is the example of the mother that has encouraged the baby-brain to exert itself. She has laughed and cooed with the baby, and has urged speech upon him; but all her urging never would have made the baby-brain exert itself if that brain did not have the power to exert itself. If it were not an embryonic man-brain it could not respond to the man-stimulus. The human child takes in words, recognizes them and then repeats them; but he does these things because his brain belongs to the man-class, because his brain is developed for the purpose. The man-function responds to the call of the man-environment, but the response in the beginning is only a reflex response; the reaction is the primitive reaction, for the mechanism is still primitive. But soon the constant effort at responding to the incoming stimuli enlarges the grasp of the cerebral centres, they become more and more conscious of what they are doing, and they begin to lose that purely animal characteristic, the reflex. But in every stage of the development of the child mind the reflex remains the dominant factor. Consciousness should be the dominant power in this brain, but it is not. Consciousness does have the directing power, but it does not have the power actually to direct. That is, consciousness is not yet strong enough for independent action; and, as with consciousness comes thought, then thought can have no greater strength than consciousness. Thought itself is, at this stage, little better than reflex action. The fact of the dominance of the reflex is the fact of greatest importance in brain development. The reflex dominated the primitive brain, and the reflex dominates the child brain. But that is not the reaction most to be desired in the human brain. It is the thought reaction that should have first place, *directed action;* consciousness should have supreme control.

We have, then, in the mind of the child factors that are subtle and far-reaching. We have the Past, an influence-complex that reaches up a thousand hands out of a loosely knit and interminable ancestral line; we have the Present, an influence-complex developed out of the action of environment upon the millions of cells that make up the cerebral cortex. It is the reactions between these complexes that determine the condition of the child-mind, or of any mind. It is the Present-Past reaction that gives the interest to the subject: it makes the child-mind, in very fact, the most in-

teresting thing in this world. The problem to be worked out is a problem in development: how may the child-mind be developed to its own best advantage? As we have seen, this is a matter of brain-development, not to be understood until the whole process of brain-development is understood. The basic facts here are these. The development of the man-brain out of the animal-brain, and hence the development of the centres of the man-brain out of the centres of the animal-brain; the development of the sensory fibres before the development of the motor; and the dominance of the reflex.

The development of the child-mind is merely the development of consciousness in the child-brain; the development of a man-power brain. But the method of developing that consciousness must be the method followed by Nature. It must follow through the reflex, and is entirely a matter of training, a training that is directed through the motor centres. Each centre must be approached in the direction of its origin. We must remember that each centre has a regular developmental position and its fibres a developmental sequence; first the afferent, next the efferent, and then the association. The afferent stimuli are the ones that arouse a centre to action and that give its reactions smoothness. After a centre has undergone this training for a certain length of time it becomes able to control its own machinery; the centre then has developed its own consciousness. But that is not enough, so far as the mind is concerned. It would suffice in the case of a purely automatic brain; but it does not suffice for independent mind. Making each centre independent makes for disharmony. Centres working alone do not work together. The ultimate endeavor, then, in striving to develop the child-mind, is, while we are developing consciousness in the centres, to make that consciousness overlap from one centre to another, to bring about an interaction between the centres. The aim is, through the development of supreme consciousness, to convert the human brain into a symmetrical and a harmonious organ; that is, an organ fully developed and fully able to take care of itself.